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A STUDY OF THE PRICE OF EGGS AS AFFECTED BY SIZE, QUALITY, AND SEASONAL DISTRIBUTION OF PRODUCTION

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Introduction

The profit obtained from a poultry enterprise depends upon the relationship between the cost of production of a dozen eggs and the price received for that dozen eggs. The cost of production depends largely upon the number of eggs produced by each hen and the cost of feeding and caring for that hen. The price received for each dozen eggs depends upon several factors, some of which the poultryman can influence. This study was made in order to discover by what means and to what extent a poultryman can improve the price he receives for his eggs.

Egg delivery vouchers, with information on flock management practices from fifty poultry flocks in the Rio Linda district, constitute the basic data for this study. The egg delivery vouchers containing prices and extensions for each grade were furnished by the Poultry Producers of Central California, to whose Sacramento branch all these poultrymen delivered their eggs. The period covered was from March 1, 1931 to February 29, 1932. This period was chosen to coincide with the record year of the poultry management study of these same cooperators. All prices shown or referred to herein are the advance payments made to the poultryman at the time of delivery. The final price would include the additional deferred payment of $0.01632 per dozen for eggs of all grades delivered during 1931.

Variations in Average Price Received

The average price per dozen eggs sold during the year varies in different flocks. The highest price was 20.1¢ and the lowest 16.5¢, although neither of these were in typical flocks. The range in typical market egg flocks was from 16.7¢ to 19.8¢, a difference of three cents. This maximum range is probably greater than the amount by which egg prices can be raised by changes in management. A comparison of the ten normal commercial flocks receiving highest prices and the ten receiving lowest prices, however, does disclose the range within which management can influence the price for eggs. This comparison is shown in Table 1.

Table 1.

Effect of Egg Price on Income per Hen from Eggs

	Unit	10 Flocks With Highest Egg Price	10 Flocks With Lowest Egg Price	Difference
Dozen Eggs Sold per Hen	Dozen	14.5	12.8	1.7
Average Price per Dozen	Cents	19.2	17.3	1.9
Egg Income per Hen	Dollars	2.78	2.21	.57
Due to price	"			.28
Due to quantity	"			.29

The above table shows the ten poultrymen obtaining highest egg prices received 28 cents more per hen because of this difference, than did the ten receiving the lowest prices.

The average price received by the ten normal commercial flocks receiving the highest prices for eggs was 19.2¢ per dozen. The ten normal commercial poultry flocks receiving the lowest egg prices received 1.9¢ less per dozen. This difference is largely due to the management of the flocks involved, and might have been avoided if the ten poultrymen who received low prices had handled their flocks and eggs in the same manner as did those receiving the highest prices. In the high group the income from increased price went almost entirely to profit, for although higher egg prices were received, expenses were no higher.

Inspection of egg grade and delivery data shows that the flocks receiving the highest prices obtained 13 per cent more of their total production in the four fall months when egg prices are higher than did those receiving the lowest prices. The group receiving highest prices also had 9 per cent more of their eggs graded as No. 1 in quality. The low price group had 1 per cent more of their total eggs classified as large eggs. The difference in price, therefore, may be attributed to better seasonal distribution of eggs and to better quality.

Factors Determining Egg Prices

The average price received by a poultryman for eggs during the period of a year is due to the seasonal distribution of egg deliveries, the quality of the eggs, and the size of the eggs. Egg prices are always higher in the four fall months of September to December, inclusive. The larger the percentage of the total year's eggs delivered during this period, the greater the average price of eggs for the year. Poultrymen selling eggs on a quality basis will also receive a higher average price for their eggs if they deliver a greater percentage of eggs of high quality. A production with a greater proportion of large sized eggs also results in a higher average egg price. The cooperators in this study had eggs graded into eight different size and quality groups, the most important requirements for which are shown in Table 2. This table also shows the percentage of total deliveries from all 50 cooperators that were classified into each grade, and the weighted average price for the period covered. Since more medium and small eggs were delivered in the fall

Table 2.

Egg Grades in Brief

Size	Quality	Min. Wt. per Doz.	Maximum Size Air Cell	Shell and Appearance	Deliveries (a)	
					Per cent of Total	Average Price (b)
		Ounces	Inches		Per Cent	Cents
Large	1	24	1/8"	Clean, Sound, White (c)	28.5	23.0
	2	24	3/16-1/4	Reasonably Clean, Sound	24.9	18.3
	3	24	3/16-3/8	Dirty, Thin Shell, etc.	13.4	17.3
Total Large	All	24	3/8"		66.8	20.2
Medium	1	20½	1/8"	Clean, Sound, Light Color	17.3	17.7
	2	20	3/16-1/4	Reasonably Clean, Sound	2.4	15.3
	3	20	3/16-3/8	Dirty, Thin Shell, etc.	2.4	14.3
Total Medium	All	20	3/8"		22.1	17.1
Small	All	16	Any	Any	6.7	9.6
Commercial		20	Any	Dirty, Checked, etc., Any	4.4	10.4
(a) Total All Eggs Delivered by Cooperators in this Study					100.0	18.3

(b) Average advance price for the year, March 1, 1931 to February 29, 1932.

(c) Yolk can be only slightly visible in No. 1 Large Grade.

when prices were higher, the differences in price shown in this table are not representative of differences in price at any particular time of the year.

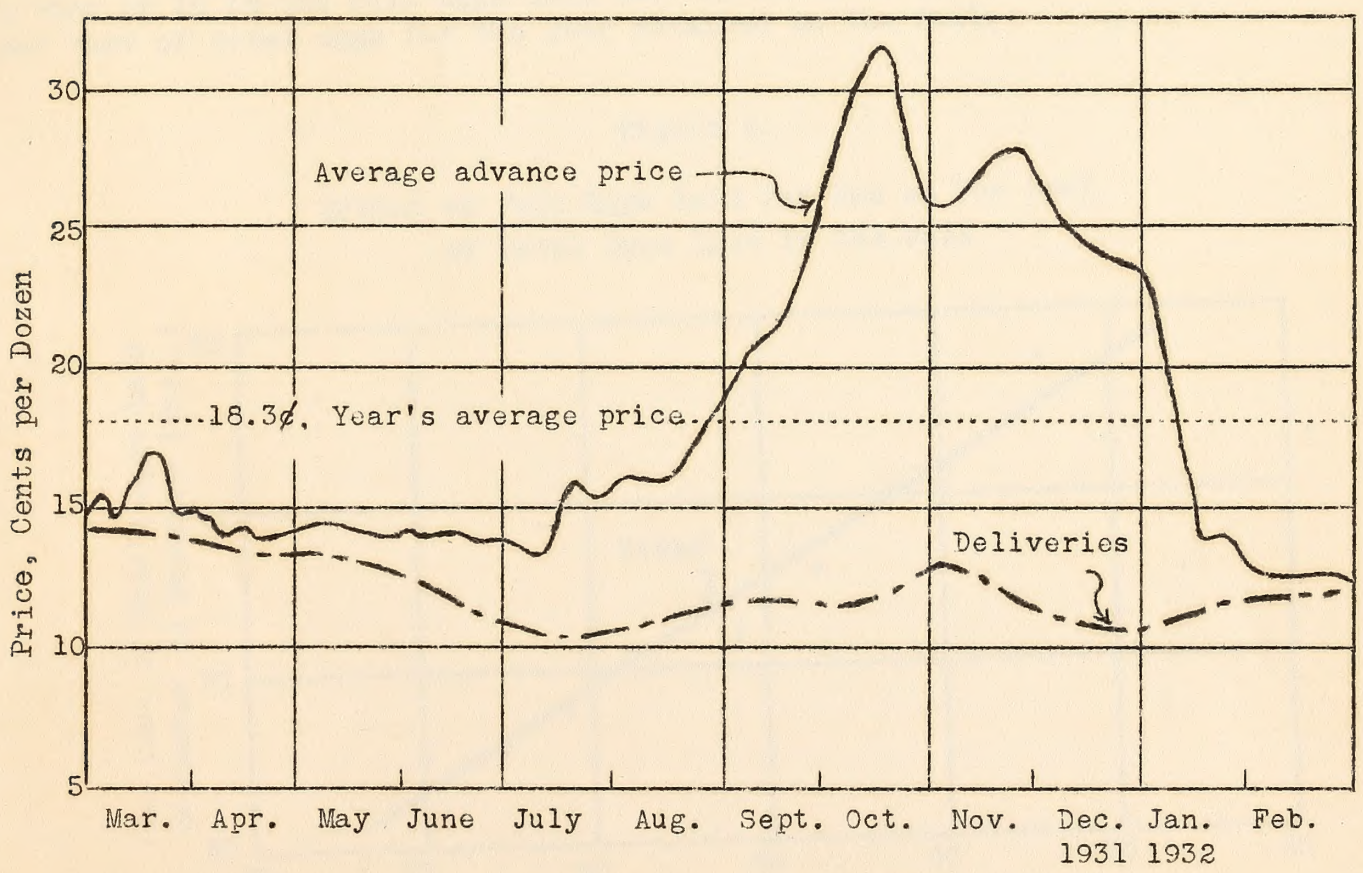
Factors Influencing the Seasonal Distribution of Eggs

The seasonal distribution of eggs delivered is determined by the relative size of the flock at different times of the year as well as by the degree to which hens lay during different seasons. Figure 1 shows the seasonal deliveries for all 50 cooperators, with the average advance price for all eggs regardless of size or quality. The distribution is shown in thousands of dozens for five-day periods, with minor fluctuations omitted. The average advance price for the year was 18.3¢ per dozen for all eggs, with a variation from 12.8¢ to 31.2¢. During the four fall months, the price was above the average for the year, while during the other eight months it was below. This indicates the desirability of obtaining a large percentage of the total annual production during this time.

Since the seasonal variation in price is much greater than the price difference between different grades of eggs, it would follow that the seasonal distribution of the eggs laid is the dominant factor in determining the average price of eggs sold during the year. The most effective figure expressing the desirable seasonal distribution of eggs is the percentage of the total year's eggs obtained in the four fall months. This per cent of eggs obtained in the fall varied from

Figure 1.

Seasonal Price Per Dozen for All Eggs Delivered,
and Dozens of Eggs Delivered by Five-Day Periods



Data from egg delivery vouchers of 50 Rio Linda poultrymen

Average advance price
Delivered
30
25
20
15
10
5
cents per dozen

a low of 20 to a high of 50 per cent. The average for all 50 flocks was 32.8 per cent, or almost one-third of the total for the year. A rise from 20 to 40 per cent of the total eggs obtained in the fall tends to cause a rise in egg prices of 1.6¢ per dozen, or 22¢ per hen. This rise is in addition to that required to offset the smaller eggs obtained from flocks containing a higher percentage of pullets. Obtaining a large percentage of the annual egg production in the four fall months is the best single opportunity to increase the average price received for all eggs.

Effect of the Seasonal Size of Flock on Seasonal Egg Distribution

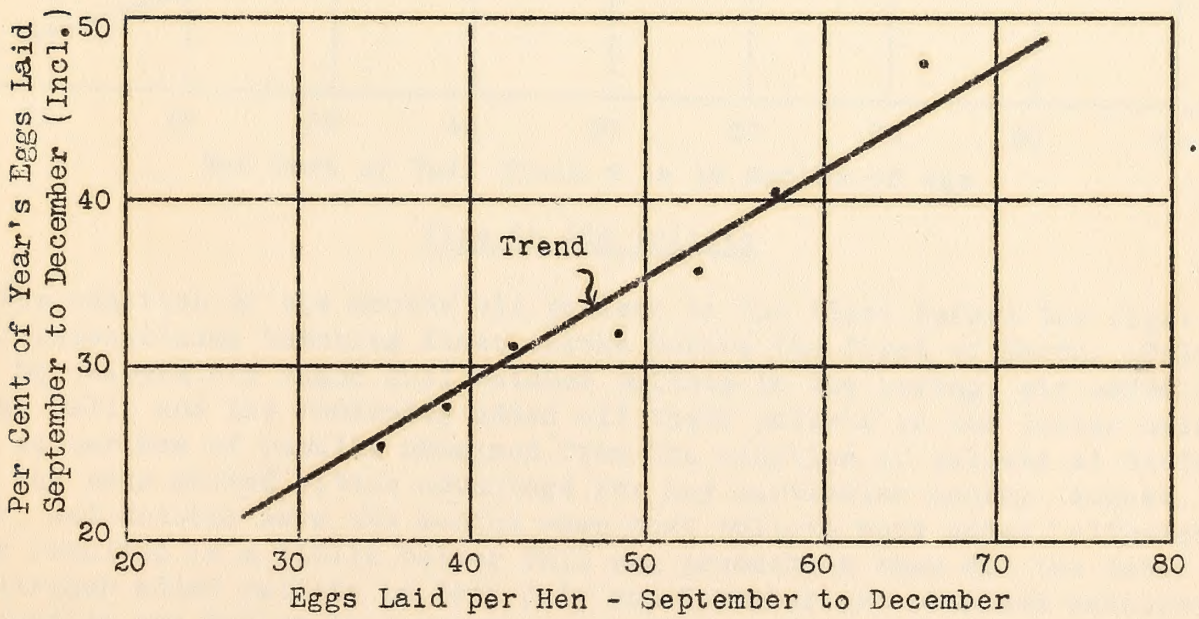
One method of securing a larger percentage of eggs in the fall is to have more birds in the flock during the fall months than at other times of the year. A study of these records shows that a ten per cent increase in the number of birds in the fall flock (based on the average number for the year) resulted in an increase of 3.8 in the per cent of eggs obtained in the fall. The addition of necessary pullets in the fall results in increasing the size of the flock at this time.

Effect of Fall Egg Production on Seasonal Distribution

The degree to which hens and pullets in the flock lay eggs during the four fall months also helps determine the percentage of all eggs obtained during this period. The average lay per hen for all hens in the 50 flocks from September to December was 47 eggs, although this varied from a low of 23.6 to a high of 71.3 eggs per hen. The latter figure was obtained in an all-pullet flock which laid at the rate of 58 per cent for the 122 days. Many commercial flocks containing both pullets and hens secured over 50 eggs per bird. Figure 2 shows the effect of fall eggs per fall bird upon the percentage of the total year's eggs laid in the fall. A rise of 10 in the fall eggs laid per hen is shown to cause a rise of 6 in the per cent of total eggs for the year obtained in the fall.

Figure 2.

Effect of Fall Eggs Laid Per Hen on Per Cent of Total Eggs Laid in the Fall



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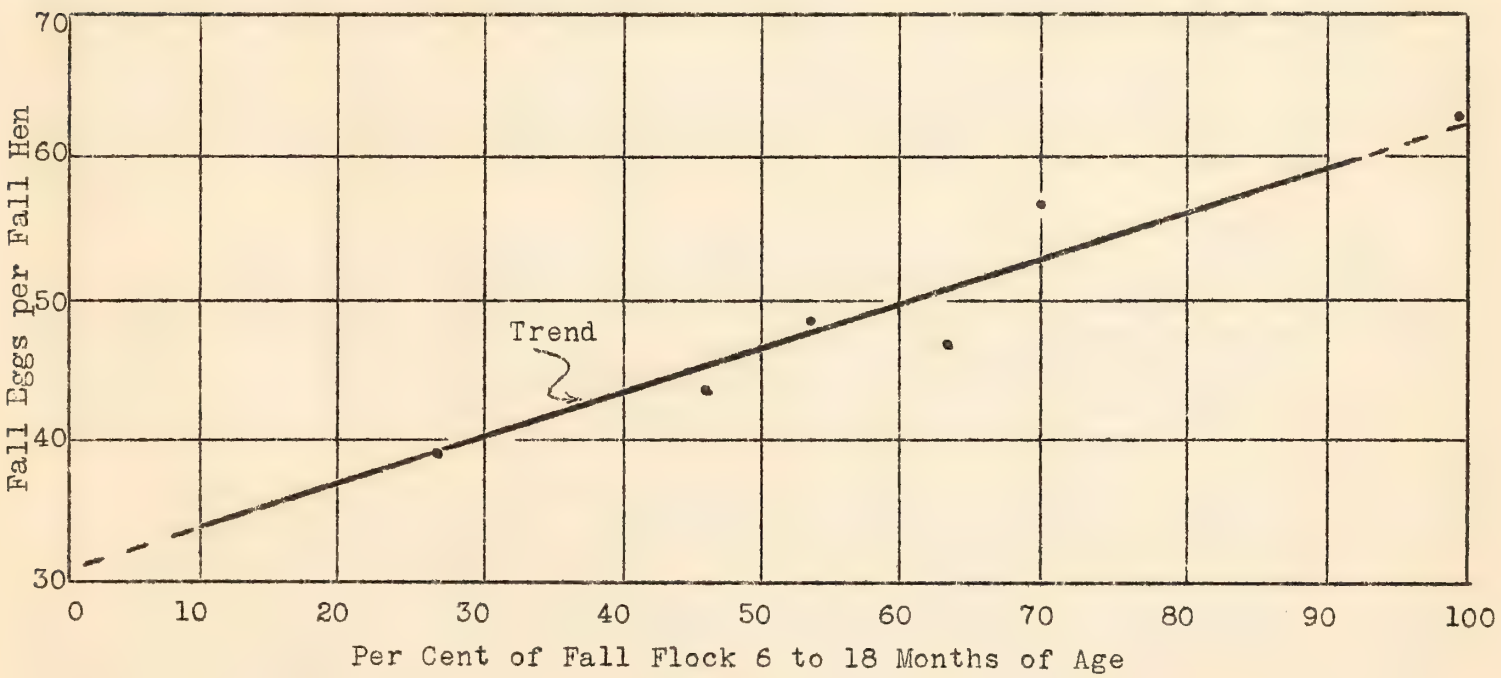
Effect of Percentage of Flock Pullets on Fall Egg Production

A high fall egg production depends largely upon the percentage of pullets in the fall flock. By pullets are meant those birds which are between the ages of six and eighteen months of age. The percentage of pullets in the fall flock affects the eggs laid per hen from September to December. Figure 3 shows that there was an increase in production from about 30 fall eggs in an all-hen flock to over 60 eggs in an all-pullet flock. These data would indicate that pullets lay about 30 more eggs per hen during this period than do hens over 18 months of age. This checks with an extensive study of 1000 commercial flocks which is being completed by the Agricultural Extension Service. Pullets are therein shown to lay about 30 more eggs during the year than do older hens. This would indicate, therefore, that these additional fall eggs are extra eggs that may be laid only in the first year of production. To secure a large fall production, a large percentage of the flock must consist of spring hatched pullets. Both a large fall flock and a high fall production are obtained by adding six months' old pullets to the flock before the beginning of September.

Figure 3.

Effect of Per Cent of Fall Flock Pullets
on Fall Eggs Laid per Fall Hen



Time to Add Pullets

The addition of six months' old pullets to the flock before the first of September necessitates hatching those chicks before the first of March. Only one of these 50 cooperators added fall hatched pullets in the spring, six added in both spring and fall, and the remainder added all their pullets in the latter half of the year. A comparison of results obtained from the addition of pullets at different times of the year showed little advantage for any particular month. August, September, and October were the months when most pullets were added, although July additions resulted in a little better fall egg production than did the later months. Four poultrymen added pullets in both July and November and obtained satisfactory fall production and better than average egg prices. Where it is necessary to brood

chicks in two broods with the same equipment, it is better to have one brood follow the other in the spring than to brood one in the spring and one in the fall. The four poultrymen who brooded two consecutive batches in the spring obtained 37 per cent of their total year's eggs in the fall, while the six who brooded in both spring and fall received only 30 per cent of their eggs in the fall. Fall hatched pullets which come into production the following spring tend to molt the following fall. This results in a lower fall production as compared with spring hatched pullets.

Poultrymen, therefore, should secure all their chicks in the early spring from January to March in order to have them in production by August. This automatically provides that the flock will be largest in the four fall months and makes possible the securing of a large percentage of the total annual egg production during these months of highest egg price.

Factors Influencing the Quality of Eggs

The poultryman selling eggs on a quality basis can benefit by improving the quality of his eggs. A No. 2 egg brings from one to two cents less per dozen than the same size No. 1 egg. A No. 3 egg brings from two to four cents less per dozen than a No. 1 egg, while commercial eggs bring several cents less per dozen than No. 3s. Different grades of small eggs do not usually bring a differential in price. The total large and medium eggs delivered by the 50 cooperators were graded as follows: 49.2% - No. 1; 29.2% - No. 2; 16.9% - No. 3; and 4.7% commercial. Individual flocks had a variation in the percentage of No. 1 eggs from 29 per cent to 70 per cent. Such a range in quality alone was sufficient to raise the average price by 1½¢ per dozen. This would indicate an opportunity for some of these poultrymen to increase their income by improving the quality of their eggs.

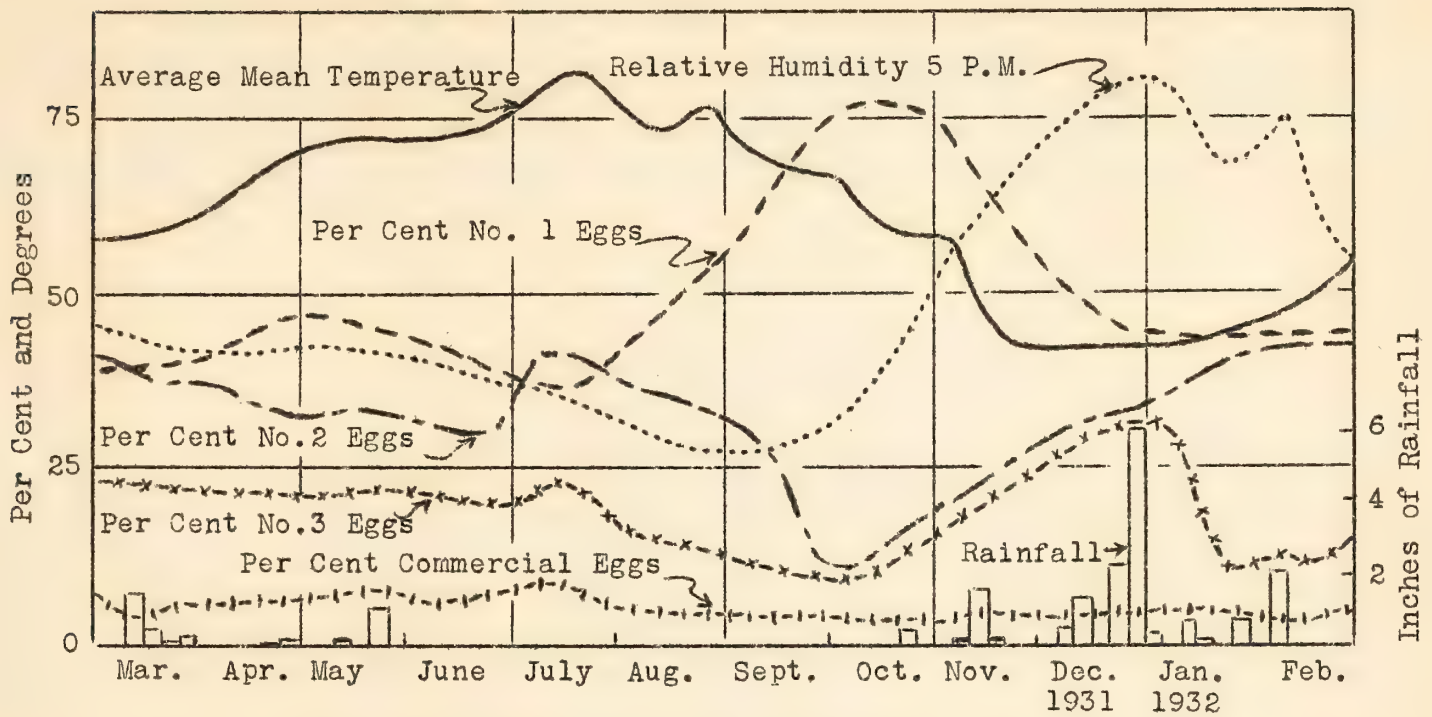
The quality grade into which an egg is classified is influenced by the size of the air cell and the internal quality as determined by candling, and by the external appearance. An off-colored shell on an egg otherwise No. 1 large, might cause it to be reduced to the No. 2 group. Egg shell color is obviously a matter of heredity, and since all flocks in this study were of the Leghorn breed, it is assumed this factor had a minor influence in the grading of these eggs.

Since evaporation of moisture from the egg is more rapid in dry weather, one would expect a drop in the percentage of No. 1 eggs in the summer. Such a drop did occur and is shown in Figure 4. This chart also shows the average mean temperature, the relative humidity at 5 p.m., and the rainfall as reported by the Sacramento Station of the United States Weather Bureau. The percentage of all large and medium eggs falling into each quality grade as delivered by these 50 poultrymen is also shown. Minor fluctuations are omitted in order to permit one to more readily observe the main variations. This chart also shows that rainfall causes a rise in percentage of No. 3 eggs. Since these are largely "dirties", it is apparent that dirty eggs increase in wet weather. All of the poultrymen included in this study confine their birds in wet weather, so these dirty eggs must be due to wet dirt or droppings in the house rather than to mud from the yards.

Several factors were studied to find those having a relationship to quality of eggs. Only those in which a definite relationship was found will be mentioned here. The number of times eggs were gathered daily had some influence on quality. In both summer and winter, gathering three times daily resulted in higher quality of eggs than where this was done only twice daily. Three poultrymen who gathered eggs four times daily in the summer obtained a better quality than did those who gathered two or three times daily.

Figure 4.

Effect of Temperature, Humidity, and Rainfall
on Quality of Eggs



Data Sacramento Office of U.S. Weather Bureau and
Egg Deliveries of 50 Poultrymen at Rio Linda

These poultrymen were divided into three groups as to time of packing eggs after gathering. Twenty poultrymen packed the eggs within an hour and obtained 38% No. 1 eggs. Nine poultrymen allowed the eggs to stand an hour or more but packed them the same day. This group had 47% No. 1 eggs. The third group of fourteen allowed the eggs to stand overnight before putting them in cases and secured only 37% No. 1 eggs.

The method of caring for packed cases before delivery had some influence on quality. The period covered by these data was from June to September, inclusive. Three poultrymen using a humidor or artificially humidified egg room had considerably better quality of eggs than did those following other methods of storage. Basements were only slightly better than ordinary dry rooms. Moistening the floor had practically no influence. A dry cover, usually canvas, over the cases improved quality slightly and was just as effective as wet sacks. The use of a humidor apparently influenced quality to the extent of raising the price .2¢ per dozen.

House litter affects the quality of eggs through its relation to the cleanliness of the shell. In both summer and winter more frequent changes of house litter are associated with fewer No. 3 eggs. A few poultrymen using rice hulls for litter secured slightly better egg quality than those using straw. Four poultrymen who used peat moss in the winter time with no more than one or two changes had a much larger percentage of No. 3 eggs or "dirties". This drop in egg quality was sufficient to cause a drop in price of .6¢ per dozen. Straw changed once a month in summer and twice a month in wet weather was quite satisfactory. Peat moss unchanged over a considerable period of time was unsatisfactory in that more dirty eggs resulted.

A poultryman can raise egg quality by cleaning nests and houses as often as necessary to avoid dirty eggs. Eggs should be gathered at least three times daily and allowed to cool in a humidified egg room for an hour or so before packing. Cases, both before and after eggs are packed should be kept in a humidified egg room. When cases are being hauled to market they should be covered to minimize evaporation. These few simple steps may not be all the poultrymen can take to secure a higher quality of product but they do eliminate losses due to dirtiness of shell and excessive evaporation. Good feeding, sanitation, control of diseases and parasites, and other management practices making for good production also tend to improve egg quality.

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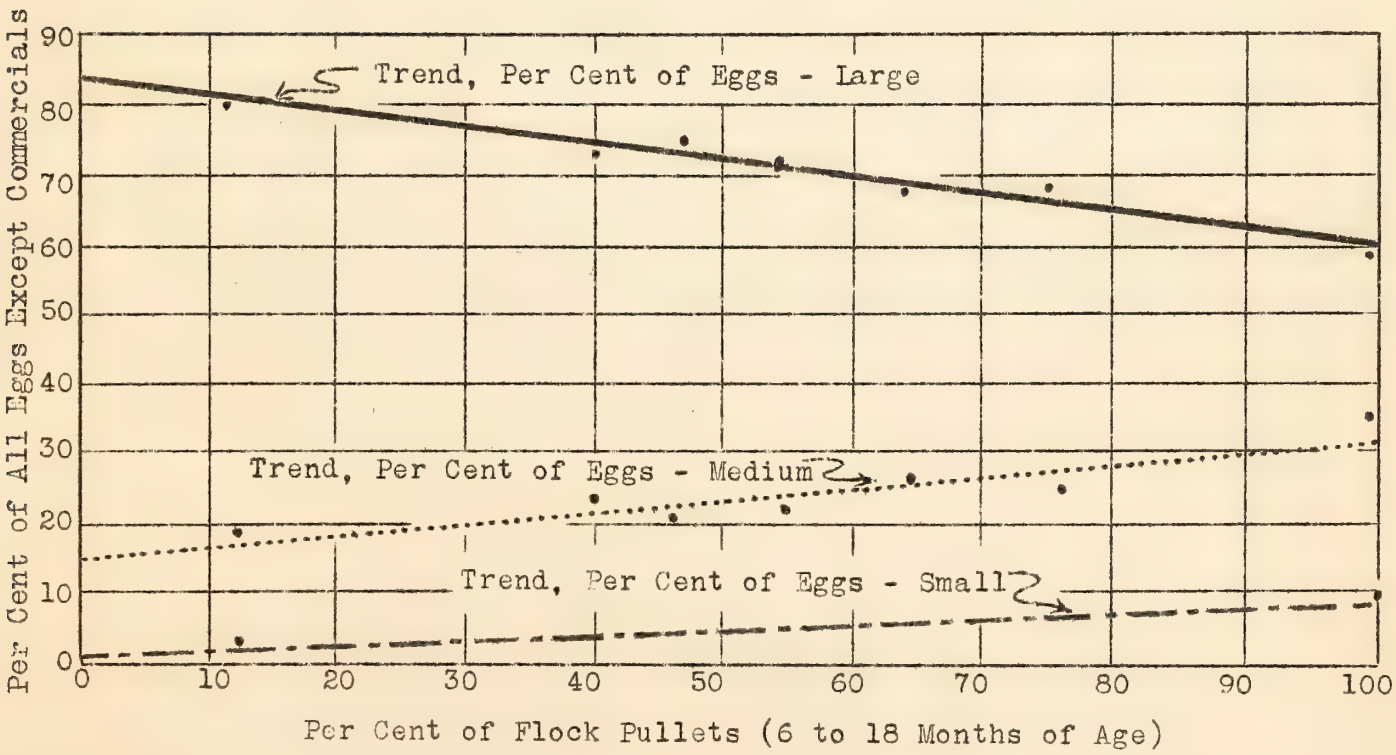
Factors Influencing the Size of Eggs

The size of eggs obtained in different flocks varied considerably. Large eggs ranged from 47.0 to 76.3 per cent. Medium eggs varied from 14.6 to 33 per cent, while small eggs varied from 2.0 to 18.2 per cent. The percentage of pullets in the flock has the greatest influence on the size of eggs but does not account for many of the differences shown. Figure 5 shows the trend of egg size for variations in the percentage of pullets. The greater the percentage of pullets the greater the percentage of medium and small eggs and the smaller the percentage of large eggs.

Figure 5.

Effect of Percentage of Flock Pullets
on Sizes of Eggs



Studies with this same group of poultrymen in previous years have shown fall hatched pullets which come into production in the spring to be associated with a lower percentage of large eggs than obtained in flocks where pullets were hatched in the spring. Only one of these 50 cooperators had all fall hatched pullets. This man obtained only 47 per cent large eggs as compared with an average of 69 per cent for the 32 who used only spring hatched pullets. Therefore, the recommendation to hatch pullets in the spring for fall addition to the flock has a further advantage in the matter of securing large eggs.

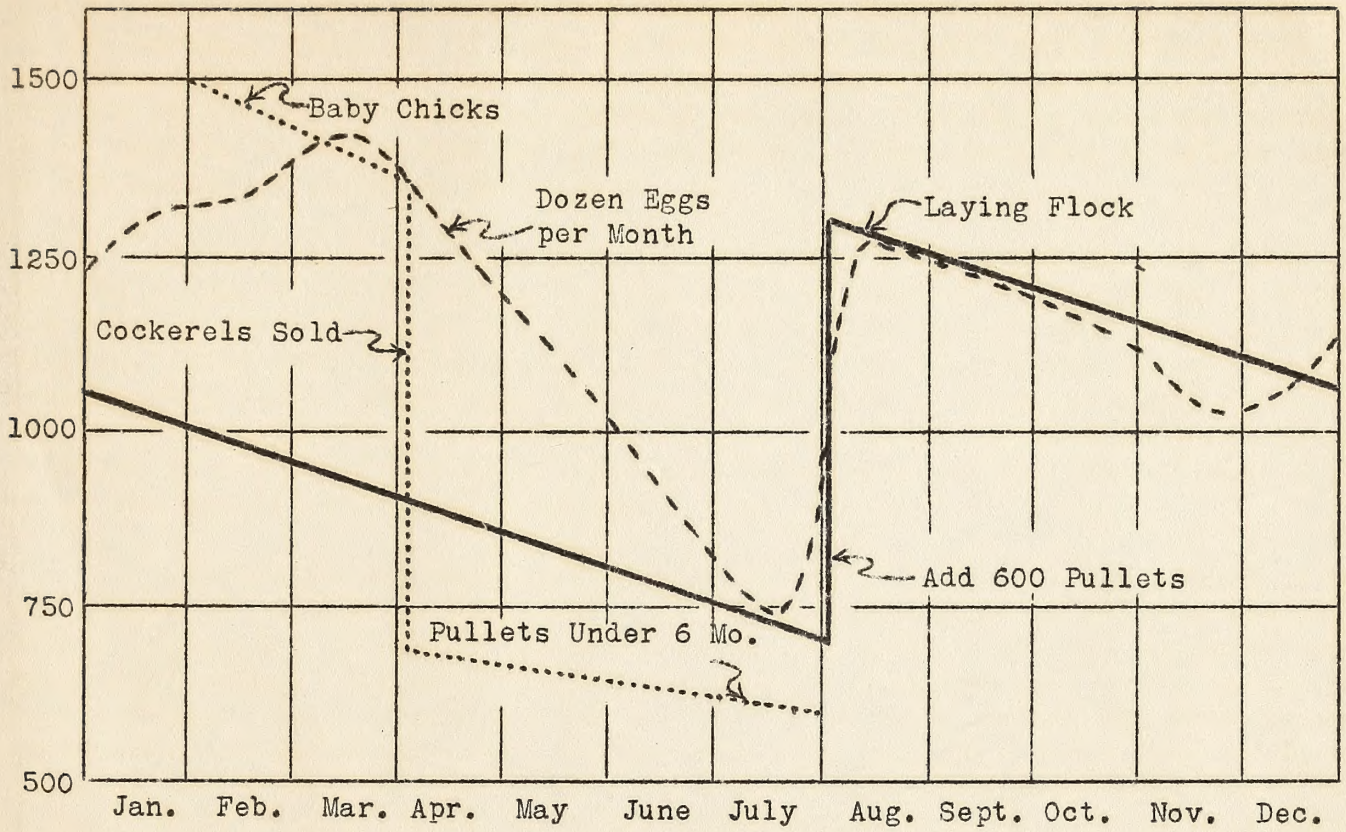
Aside from the influence of age and time of hatching upon the size of eggs laid by a hen, a certain amount of influence is exerted by heredity. A comparison was made of several flocks from three hatcheries to see if any difference in size existed. When group results were corrected for the percentage of pullets, it was found that a slight difference existed in the size of eggs, although all three groups were above average. The only conclusion warranted is that poultrymen should endeavor to secure chicks from breeding flocks in which the size of eggs laid is among the qualifications of a breeder.

A desirable seasonal distribution of eggs requires the presence of a large percentage of pullets in the flock. The large proportion of pullets results in a larger percentage of medium and small eggs. It would seem that the small sized eggs might offset gain in price due to seasonal distribution. Such is not the case, however, because medium eggs are higher in price during the fall months than large eggs are during the rest of the year. The pullets coming into production in the fall lay their small eggs and then their medium eggs when these are high in price. Production of small or medium eggs during the time of year when eggs are cheap should and can be avoided only by using pullets hatched in the early spring.

Since a high percentage of pullets in the flock results in a higher average egg price, there might be a tendency to carry the percentage of pullets to an extreme by selling all hens and replacing them with pullets. Such a practice did not result in sufficient increase in egg income to overcome the loss incurred when hens were sold for 30¢ and the net cost of a pullet was 80¢. The replacement of normal death losses and culled hens usually requires the addition of about 600 pullets for each 1000 birds of the flock average for the year. The thousand birds would number about 700 or 800 each summer before the adding of pullets. It would be increased to 1300 or 1400 by the addition of the 600 pullets, at which time the pullets would make up about 40 to 50% of the flock. Mortality and culling would gradually reduce the flock to 700 or 800 again by the following summer. This poultry flock cycle would result in the best combination of high egg prices and low stock replacement costs. It is shown graphically in Figure 6.

Figure 6.

Flock Cycle for Maintaining a Yearly Average of 1000 Hens



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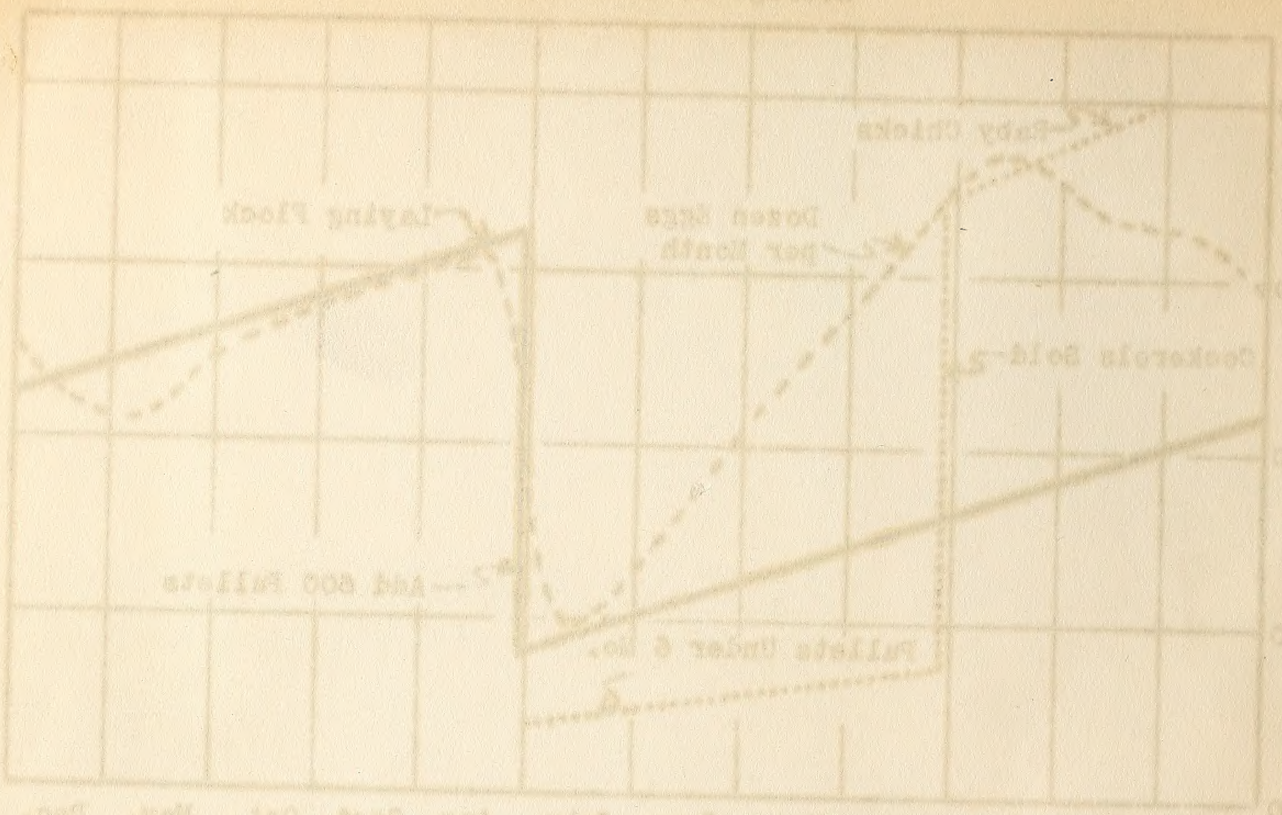
Summary

Poultrymen may improve their average annual price of eggs by securing more eggs in the fall and by improving the quality of these eggs. Larger eggs also bring a better price, but the numbers obtained can be increased by the poultryman only by using spring hatched chicks from properly selected breeding stock.

The annual addition to the flock of spring hatched pullets which come into production about the first of August will result in a large percentage of the year's eggs being obtained in the fall months, September to December, inclusive.

The percentage of pullets, however, cannot be greatly increased beyond that point necessary to maintain the flock without also increasing costs which are incurred when a replacement of good hens is made by more expensive pullets. The addition of sufficient pullets each August to bring the flock up to capacity results in the best combination of good egg prices and low production costs.

Egg quality can be raised by reducing the loss of moisture from eggs before delivery, and by reducing the number of dirty eggs. Frequent gathering, and humidified storage or other protection will reduce the amount of evaporation. Frequent changes of house and nest litter will reduce the number of dirty eggs.